REMARKS

Claims 1-2, 9-10, 15-16, 18-21, and 23-36 are pending.

The applicants appreciate the Examiner's reconsideration of the rejections based on U.S. Patent No. 5,561,477 to Polit based on the remarks included in the Statement in Support of the Pre-Appeal Brief Request for Review.

One embodiment of the invention is directed to a method of processing video data to detect field characteristics of the data, and in particular, to detect whether a field is progressive or interlaced. The method includes calculating first and second difference values as differences between pixels of a current field and pixels of a previous field and differences between the pixels of the current field and pixels of a subsequent field, respectively. In contrast to prior art methods, the method calculates a ratio between the first and second difference values, compares the ratio to a threshold, and determines whether the current field is an interlaced field or a progressive field with respect to the subsequent field based on the comparison.

Claims 1-2, 9-10, 26-27, and 29-30 were rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 5,452,011 to Martin et al. ("Martin") in view of U.S. Patent No. 5,508,750 to Hewlett et al. ("Hewlett").

Claim 1 is nonobvious in view of Martin and Hewlett because several of the elements recited in claim 1 are missing from Martin and Hewlett. In particular, neither reference teaches or suggests: 1) calculating a ratio between first and second difference values of differences between pixels of first and second fields, and first third fields, respectively; 2) comparing the ratio with a threshold; and 3) determining whether said first field is an interlaced field or a progressive field with respect to said third field based on based on the comparing step.

Martin and Hewlett do not teach or suggest calculating the ratio between the difference values recited in claim 1. The Examiner correctly notes that Martin calculates a ratio R, but that ratio is not the ratio recited in claim 1. Hewlett does not compute any ratio. Instead, Hewlett computes difference values between successive fields,[1] compares the difference values

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[1]   Note that Hewlett computes differences between the first T1 and the second T1 and between the second T1 and T2, and differences between B1, B2 and B2, B3 to determine whether any of the fields are repeated. This enables Hewlett to perform a reverse 3:2 pull-down to convert the input 30 frames per second to 24 frames per

to a threshold, produces a 0 if the difference value is less than the threshold, and produces a 1 if the difference value is greater than the threshold (col. 3, lines 56-65).

Comparing two difference values to a threshold does not compute any ratio. For example, suppose for simplicity that the T1 field has a single value of 5, the T2 field has a single value of 15, and the threshold is 2. The difference value for the T1,T1 comparison would be 0 and the difference value for the T1, T2 comparison would be 10. The first difference value is less than the threshold of 2, and the second difference value is greater than 2, so Hewlett would output a 0, 1. Such values of 0 and 1 do not reflect the ratio between the difference values which would be 0/10 or 10/0 depending on which way the ratio is calculated.

Martin and Hewlett do not teach or suggest comparing the ratio between the difference values to a threshold. Given that Martin and Hewlett do not teach or suggest the ratio recited in claim 1, Martin and Hewlett cannot teach or suggest comparing that ratio to a threshold. Even if Hewlett had computed a ratio, there is no suggestion in the prior art to use such a hypothetical Hewlett ratio in Martin's comparison of the ratio R to the threshold W (see step 56 of Fig. 2). Hewlett's reason for calculating difference values is to determine whether a field is repeated so that the repeated field can be deleted and the 30 frame/second input can be converted to a 24 frame/second format. Nothing in the prior art suggests that such a hypothetical ratio for detecting and deleting repeated fields could be used with Martin's ratio/threshold comparison for an interlaced field determination.

Martin and Hewlett also do not teach or suggest determining whether said first field is an interlaced field or a progressive field with respect to said third field based on based on the comparing step. Given that Martin and Hewlett do not compute the ratio recited in claim 1, and do not compare such a ratio to a threshold, Martin and Hewlett cannot suggest making an interlaced vs. progressive determination based on such a comparing step.

Even if Hewlett had taught one to compute the ratio recited in claim 1, one skilled in the art would not be motivated to use such a hypothetical ratio in Martin's method of determining whether two fields are interlaced. Martin makes the progressive/interlaced

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second. Hewlett would not compute the difference between T1 and B1 because that would not assist Hewlett in the determination of whether a field is repeated.

determination on order to determine whether a repeated field can be removed (col. 3, lines 59-65). The progressive/interlaced determination is thus an intermediate step in finding a repeated field. If one skilled in the art were looking to Hewlett to improve Martin's method, that skilled person would not use Hewlett's method to improve the intermediate step of the progressive/interlaced determination. Instead, that skilled person would simply replace Martin's entire method of finding a repeated field with Hewlett's method of finding a repeated field.

Applicants disagree with the Examiner's assertion that Hewlett discloses calculating a ratio "in order to get a more accurate measurement of characteristics in a video sequence for determining whether two fields of a video sequence are interlaced or progressive" (page 3, lines 13-21 of Office Action). Hewlett does not suggest that his method gets a more accurate measurement of anything. Instead, as discussed above, Hewlett computes the difference values simply to find and delete repeated fields in order to convert from 30 frames/second to 24 frames/second without ever implying any increase in accuracy. Also, Hewlett never states or implies that computing difference values, computing a ratio, or deleted repeated fields could be used to make a progressive vs. interlaced determination.

For the foregoing reasons, claim 1 is nonobvious in view of the cited prior art.

Claims 2, 26, and 29-30 depend on claim 1, and thus, are also not obvious in view of Martin and Polit.

Although the language of claims 9-10 is not identical to that of claims 1-2, the allowability of claims 9-10 will be apparent in view of the above discussion.

Martin and Hewlett do not teach or suggest the invention recited in claim 27. Claim 27 recites "determining whether said first field is an interlaced field or a progressive field with respect to said third field based on said steps of calculating …" As discussed above, Martin and Hewlett do not teach or suggest such a determining step, and thus, claim 27 is nonobvious.

In addition, claim 27 recites "verifying whether a scene-change has occurred before performing said calculating steps." Hewlett does mention a scene cut detection, but does not suggest verifying whether a scene-change has occurred <u>before performing said calculating steps</u>. Instead, Hewlett performs calculating steps during the scene cut detection, and thus, does not suggest the scene cut detection before the calculating steps..

Martin and Hewlett do not teach or suggest any of the other features of claim 27 regarding a response to a determination of a scene change. First, claim 27 states that, if the step of verifying reveals that a scene-change has occurred, then the method includes performing a moving pixel detection to determine whether first and second fields are interlaced. Martin does not perform any moving pixel determination and Hewlett simultaneously determines whether there is motion or a scene cut rather than performing a moving pixel detection after verifying whether a scene-change has occurred.

Martin and Hewlett also do not suggest the steps of the moving pixel determination recited in claim 27. In particular, claim 27 recites calculating first and second differences respectively between first and third pixels of a first field and a second pixel of a third field. Neither Martin nor Hewlett suggests comparing two pixels of a first field with the same pixel of another field. Instead, Martin and Hewlett both compare one pixel of one field with only one pixel of another field.

For the foregoing reasons, claim 27 is nonobvious in view of Martin and Hewlett.

Claims 15-16, 18-21, 23-25, 28, and 31-36 were rejected under 35 U.S.C. § 103 as being unpatentable over Martin and Hewlett in view of U.S. Patent No. 4,661,853 to Roeder.

The cited references do not teach or suggest the invention recited in claim 15. Claim 15 recites that calculating the first difference value comprises calculating pixel differences between the pixel of the first field and two pixels of the second field; selecting a smaller pixel difference between the pixel differences; and accumulating the smaller pixel difference. The Examiner admitted that Martin and Hewlett do not teach those features, but asserted that Roeder does.

The applicants also disagree with the Examiner's assertion that Roeder teaches calculating pixel differences between a pixel of a first field and two pixels of a second field. The applicants submit that the Examiner is mistakenly assuming that the numbers in the circles of Fig. 1D are pixel identifiers and that the groups 39, 40, 41, and 42 indicate that pixel differences are taken between the circled pixels. That is not correct. Each circled number in Fig. 1D is an inter-frame pixel difference, that is, the difference between a pixel in one frame and the pixel at the same location in another frame (see col. 2, lines 61-62). The groups 39, 40, 41, and 42 are

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simply sub-arrays of already-computed pixel differences that only indicate which pixel differences are taken into account in determining whether there is image motion with respect to the central pixel (the pixel indicated by the pixel difference 13 in Fig. 1D).

Roeder never suggests calculating differences between the circled pixel difference values. Instead, as indicated at col. 2, lines 63-67, each pixel difference is compared to a threshold value, assigned a logic one if the pixel difference exceeds the threshold value, and assigned a logic zero if the pixel difference does not exceed the threshold value. If all of the logic values for the sub-arrays 39-42 of pixel differences are logic one, then a motion indicative signal is generated for the central pixel difference 13 (col. 3, lines 36-39). Thus, there simply is no calculation of pixel differences between a pixel of a first field and two pixels of a second field.

The applicants disagree with the Examiner's assertion that Roeder suggests selecting the smaller of the two pixel differences discussed above. As discussed above, Roeder simply selects a logic zero or a logic one for a single pixel difference rather than selecting the smaller of two pixel differences.

For the foregoing reasons, claims 15-16 are nonobvious in view of Martin, Hewlett, and Roeder.

The cited references do not teach or suggest any of the features of claim 25. Claim 25 recites calculating the number of moving pixels between said second and third fields, wherein the determining step includes determining that said first field is an interlaced field if said number is lower than a moving pixel threshold, and determining that said first and third fields are progressive if said number is not lower than the moving pixel threshold. As with claim 15, the Examiner admits that Martin and Hewlett do not teach the recited elements of claim 25, but mistakenly asserts that Roeder supplies the missing teaching.

Martin, Hewlett, and Roeder do not teach or suggest the claimed invention because Roeder does not supply the teachings of the elements of claim 25 that are missing from Martin and Hewlett. Figures 5-8 of Roeder show various embodiments of logic circuits that can be used to detect motion, but none of the embodiments count moving pixels and compare the moving pixel count to a threshold. Figures 5-6 involve logically ANDing various combinations

of binary pixel differences (see col. 2, lines 62-68 for conversion of pixel differences to binary values) and logically Oring the outputs of the AND gates (110-116 or 120-126). Figures 7 and 8 are logic circuits that provide various combinations of pixel difference sign values and magnitude values. None of the logic gates of Figures 5-8 would provide a count value of the number of moving pixels or compare a count value to a threshold. For example, the AND gate 110 determines whether all of the magnitude inputs 13, 14, 18, 19 are logical ones, but those magnitude inputs are not indications of moving pixels, so the output of the AND gate 110 is not anything representing a count of moving pixels.

For the foregoing reasons, claim 25 is not rendered obvious by the cited prior art.

For the remaining claims, their obviousness will be apparent in view of the above discussion. In particular, although the language of claims 23-24 and 34 is not identical to that of claim 15, the allowability of claims 23-24 and 34 will be apparent in view of the discussion of claim 15. Although the language of claims 18-20 and 31-36 is not identical to that of claim 25, the allowability of claims 18-20 and 31-36 will be apparent in view of the above discussion of claim 25. Although the language of claims 32-33 is not identical to that of claim 1, the allowability of claims 32-33 will be apparent in view of the above discussion of claim 1. Although the language of claims 35-36 is not identical to that of claim 27, the allowability of claims 35-36 will be apparent in view of the above discussion of claim 27.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,

SEED Intellectual Property Law Group PLLC

/Robert Iannucci/

Robert Iannucci
Registration No. 33,514

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701 Fifth Avenue, Suite 5400
Seattle, Washington 98104
Phone: (206) 622-4900
Fax: (206) 682-6031

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